Declaration of Chris Liao

Redacted Version of Document Sought to be Sealed

QUINN EMANUEL URQUHART & SULLIVAN, LLP

Diane M. Doolittle (CA Bar No. 142046)
dianedoolittle@quinnemanuel.com
Sara Jenkins (CA Bar No. 230097)
sarajenkins@quinnemanuel.com
555 Twin Dolphin Drive, 5th Floor
Redwood Shores, CA 94065
Telephone: (650) 801-5000
Facsimile: (650) 801-5100

Andrew H. Schapiro (admitted *pro hac vice*)
andrewschapiro@quinnemanuel.com
Teuta Fani (admitted *pro hac vice*)
teutafani@quinnemanuel.com
191 N. Wacker Drive, Suite 2700
Chicago, IL 60606
Telephone: (312) 705-7400
Facsimile: (312) 705-7401

Stephen A. Broome (CA Bar No. 314605)
stephenbroome@quinnemanuel.com
Viola Trebicka (CA Bar No. 269526)
violatrebicka@quinnemanuel.com
Crystal Nix-Hines (Bar No. 326971)
crystalnixhines@quinnemanuel.com
Alyssa G. Olson (CA Bar No. 305705)
alyolson@quinnemanuel.com
865 S. Figueroa Street, 10th Floor
Los Angeles, CA 90017
Telephone: (213) 443-3000
Facsimile: (213) 443-3100

Josef Ansorge (admitted *pro hac vice*)
josefansorge@quinnemanuel.com
Xi ("Tracy") Gao (CA Bar No. 326266)
tracygao@quinnemanuel.com
Carl Spilly (admitted *pro hac vice)*
carlspilly@quinnemanuel.com
1300 I Street NW, Suite 900
Washington D.C., 20005
Telephone: (202) 538-8000
Facsimile: (202) 538-8100

Jomaire Crawford (admitted *pro hac vice*)
jomairecrawford@quinnemanuel.com
51 Madison Avenue, 22nd Floor
New York, NY 10010
Telephone: (212) 849-7000
Facsimile: (212) 849-7100

Jonathan Tse (CA Bar No. 305468)
jonathantse@quinnemanuel.com
50 California Street, 22nd Floor
San Francisco, CA 94111
Telephone: (415) 875-6600
Facsimile: (415) 875-6700

Attorneys for Defendant Google LLC

UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA, OAKLAND DIVISION

CHASOM BROWN, *et al.* individually and on behalf of all similarly situated,

Plaintiffs,

v.

GOOGLE LLC,

Defendant.

Case No. 4:20-cv-5146-YGR-SVK

DECLARATION OF CHRIS LIAO RE: [redacted]

The Honorable Susan van Keulen

I, Huei-Hung "Chris" Liao, declare as follows:

1. I am currently a Software Engineer manager and lead for Ads Identity & Infrastructure at Google and have been employed at Google for the past 10 years. In my role as a manager and tech lead for Ads Identity & Infrastructure, I manage teams responsible for the [redacted] and other parts of Google's ads serving infrastructure. As a result of my role and responsibilities, I am familiar with signals sent from a Chrome browser to Google in ad requests, and am aware of a [redacted]. Except where otherwise indicated, I make this declaration based on my own personal knowledge and could competently testify thereto.

2. I received a litigation hold for this matter on December 2, 2020.

3. In March 2019, my team and I worked with a group of Chrome engineers to estimate [redacted]. A "signal" in this context means information sent from the browser for a dedicated purpose. For example, the user-agent HTTP header is a signal sent from a Chrome browser to websites, including Google, for websites to properly render information.

4. I understand that the absence of a signal specific to Chrome's Incognito mode is intentional; a key design principle for private browsing mode is that it should not be detectable to the website being visited. *See* W3C TAG Observations on Private Browsing Modes (describing how "browser vendors should work towards achieving private browsing mode" so that it is "indistinguishable" from the "normal mode" to the sites being visited "to respect the user's privacy in choosing it.").

5. [redacted]

[redacted]

[redacted] In computer science, we sometimes refer to such an approximate method as a "heuristic." I understood then, as I do now, that this method is not a reliable means to detect Chrome Incognito traffic. This method is based on the fact that the X-Client-Data header is generally not sent by browsers in Chrome's Incognito mode. However, there are two primary hurdles associated with using the absence of this header to infer Incognito mode, which I discuss in turn below.

6. *First*, assuming one has accurately identified all Chrome traffic, [redacted]

[redacted] Therefore, relying on the X-Client-Data header in Chrome traffic to indicate Incognito mode will erroneously count traffic from non-Incognito sessions as traffic from Incognito sessions.

7. *Second*, this heuristic relies on being able to accurately identify all Chrome traffic. The X-Client-Data header is only sent from Chrome browsers; other browsers will not send an X-Client-Data header. It is therefore necessary to isolate Chrome traffic from all of the other browser traffic that does not include X-Client-Data header. Another header, the user-agent header, is used to determine whether a request came from a Chrome browser. Unfortunately, however, the user-agent HTTP header is easy to spoof and manufacture. Therefore, this method will falsely count all traffic coming from browsers in which the user-agent has been altered to indicate it is coming from a Chrome browser. Altering user-agent is not a theoretical concern. Apple's Safari browser has a built-in feature that permits users to spoof a Chrome user-agent and there are Mozilla Firefox add-ons that fulfill the same function.

8. The need for the approximation of Chrome Incognito mode through the method below arose because [redacted]

[redacted] I therefore used the heuristic method described above to provide an approximate [redacted]

9. In May 2020, as a continuation of the work related to the [redacted], my team was asked to help identify [redacted] for example, Apple Safari and Chrome Incognito (the "[redacted]"). The purpose of this exercise was [redacted].

10. For the [redacted], I tasked two engineers on my team, Bert Leung and Mandy Liu, [redacted]. The team decided to create a [redacted]

[redacted] The value of this field is a binary unit or "bit," which is the smallest unit of data storage in computing and has only a 1 or 0 value. [redacted]

[redacted]

11. [redacted]

[redacted]

c.

12. [redacted]

13. During my December 3, 2021 deposition in this case, counsel asked me about [redacted]

[redacted]

Further, as I stated at my deposition, "[redacted]

[redacted]

[redacted]

I declare under penalty of perjury of the laws of the United States that the foregoing is true and correct. Executed in Sunnyvale, California on April 4, 2022.

DocuSigned by:
Chris Liao
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Chris Liao